

NON-ISOLATED DC/DC CONVERTERS

4.5V-14V Input

0.8V-5.5V/8A Output

bel
POWER PRODUCTS

x7AH-08E Series

PRELIMINARY

- Non-Isolated
- Fixed Frequency
- High Efficiency
- High Power Density
- Low Cost
- Remote On/Off
- Under-voltage Lockout (UVLO)
- OCP/SCP
- Wide Trim Range



Description

The Bel x7AH-08E1A0 modules are a series of non-isolated, step down DC/DC converters that operate from 4.5V to 14V source. These converters are available in a range of output voltages from 0.8V to 5.5V. It is packaged in a compact, overmolded package rated at 8A. Optional lead forming provides a vertical mount product for minimal footprint or a surface mount option for a very low profile. The output is closely regulated and the efficiency for 5V output is typically 93% at full load.

Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Part Number Surface Mount	Part Number Vertical Mount
0.8V - 3.63V	4.5V – 14V	8A	26.4W	91%	S7AH-08E1A0	V7AH-08E1A0
4.5V – 5.5V	8V – 14V	8A	44W	93%	S7AH-08E500	V7AH-08E500

Note: Add “0” suffix at the end of the model number to indicate “Tube Packaging”, and “R” for “Reel Packaging”, and “G” for “Tray Packaging”.

Absolute Maximum Ratings

Parameter	Min	Typ	Max	Notes
Input Voltage (continuous)	-0.3V	-	15V	
Output Enable Terminal Voltage	-0.3V	-	14V	
Ambient Temperature	-40°C	-	85°C	
Storage Temperature	-55°C	-	125°C	

Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage				
Vo=4.5V-5.5V	8.0V	-	14V	
Vo=0.9V-3.63V	4.5V	-	14V	
Input Current (full load)				
Vo=5.0V	-	-	5.4A	
Vo=3.3V	-	-	6.7A	
Vo=2.5V	-	-	5.3A	
Vo=1.8V	-	-	3.2A	
Vo=1.5V	-	-	3.0A	
Vo=1.2V	-	-	2.8A	
Vo=0.9V	-	-	2.0A	
Input Current (no load)	-	-	100mA	
Remote Off Input Current	-	3mA	10mA	
Input Reflected Ripple Current (pk-pk)	-	180mA	-	With simulated source impedance of 500nH, 5Hz to 20MHz; use two 47uF/16V low ESR Tantalum capacitors.
Input Reflected Ripple Current (RMS)	-	50mA	-	

NON-ISOLATED DC/DC CONVERTERS

4.5V-14V Input

0.8V-5.5V/8A Output



Input Specifications (continued)

Parameter	Min	Typ	Max	Notes
I _{in} Inrush Current Transient	-	0.04A ² s	-	
Turn-on Voltage Threshold	-	4.3V	-	x7AH-08E1A0
	-	7.5V	-	x7AH-08E500
Turn-off Voltage Threshold	-	4.0V	-	x7AH-08E1A0
	-	7.2V	-	x7AH-08E500

Output Specifications

Parameter	Min	Typ	Max	Notes
Output Voltage Set Point				
Vo=5.0V	4.900V	5.0V	5.100V	Test condition: Vin=12V, Iout=50% full load
Vo=3.3V	3.234V	3.3V	3.366V	
Vo=2.5V	2.450V	2.5V	2.550V	
Vo=1.8V	1.764V	1.8V	1.836V	
Vo=1.5V	1.470V	1.5V	1.530V	
Vo=1.2V	1.176V	1.2V	1.224V	
Vo=0.9V	0.882V	0.9V	0.918V	
Line Regulation				
Vo=5.0V	-	±15mV	±25mV	
Vo=3.3V	-	±10mV	±16.5mV	
Vo=2.5V	-	±8mV	±12.6mV	
Vo=1.8V	-	±5mV	±9mV	
Vo=1.5V	-	±5mV	±9mV	
Vo=1.2V	-	±4mV	±8mV	
Vo=0.9V	-	±4mV	±8mV	
Load Regulation				
Vo=5.0V	-	±15mV	±25mV	
Vo=3.3V	-	±10mV	±16.5mV	
Vo=2.5V	-	±8mV	±12.5mV	
Vo=1.8V	-	±5mV	±9mV	
Vo=1.5V	-	±5mV	±9mV	
Vo=1.2V	-	±4mV	±8mV	
Vo=0.9V	-	±4mV	±8mV	
Regulation Over Temperature (-40°C to 85°C)	-	30mV	50mV	
Output Current	0A	-	8A	
Current Limit Threshold	10A	-	20A	
Short Circuit Surge Transient	-	TBD	-	
Ripple and Noise (RMS)	-	15mV	30mV	BW = 0-20MHz; with a 1uF ceramic capacitor and a 10uF/10V Tantalum capacitor at the output.
Ripple and Noise (pk-pk)	-	50mV	80mV	
Turn on Time	-	8mS	20mS	
Overshoot at Turn on	-	0%	3%	
Output Capacitance	0uF	-	3200uF	
Transient Response				
50% ~ 100% Max Load	Overshoot	All	-	di/dt = 0.5A/uS; Vin = 12V; with a 1uF ceramic capacitor and a 10uF/10V Tantalum capacitor at the output.
	Settling Time		-	
100% ~ 50% Max Load	Overshoot		-	
	Settling Time		-	

Note: All specifications are typical at 12V input, full load at 25°C unless otherwise stated.

NON-ISOLATED DC/DC CONVERTERS

4.5V-14V Input

0.8V-5.5V/8A Output



General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency				Measured at Vin=12V, full load
Vo=5.0V	89%	93%	-	
Vo=3.3V	87%	91%	-	
Vo=2.5V	86%	90%	-	
Vo=1.8V	84%	88%	-	
Vo=1.5V	82%	86%	-	
Vo=1.2V	81%	85%	-	
Vo=0.9V	76%	80%	-	
Switching Frequency	-	330KHz	-	
Output Trim Range	90%Vo	-	403%Vo	x7AH-08E1A0 ¹
	90%Vo	-	110%Vo	x7AH-08E500 ²
Remote Sense Compensation	-	-	0.2V	
MTBF	TBD			Calculated Per Bell Core TR-332 (Io = Nominal; Ta = 25°C)
Dimensions (surface mount)				
Inches (L × W × H)	0.78 x 0.7 x 0.32			
Millimeters (L × W × H)	19.81 x 17.78 x 8.13			
Dimensions (vertical)				
Inches (L × W × H)	0.7 x 0.308 x 0.65			
Millimeters (L × W × H)	17.78 x 7.82 x 16.51			
Weight	-	6g	-	

Notes: All specifications are typical at 25°C unless otherwise stated.

1. The output voltage is 0.9V at trim pin is open.
2. The output voltage is 5.0V at trim pin is open.

Control Specifications

Parameter	Min	Typ	Max	Notes
Remote On/Off				
Signal Low (Unit Off)	-0.3V	-	0.8V	Remote on/off pin open, unit on.
Signal High (Unit On)	2.4V	-	14V	

NON-ISOLATED DC/DC CONVERTERS

4.5V-14V Input

0.8V-5.5V/8A Output



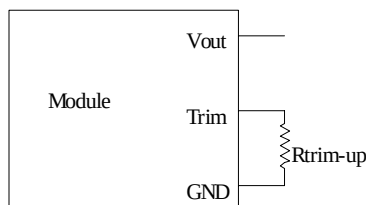
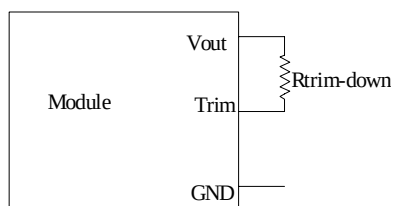
Output Trim Equations

1) x7AH-08E1A0

Equations for calculating the trim resistor (in kΩ) given the desired adjusted voltage (V_{adj}) and the nominal output voltage of the converter (V_{nom}) are shown below. The Trim Down resistor should be connected between the Trim pin and Vout. The Trim Up resistor should be connected between the Trim pin and Ground. Only one of the resistors should be used for any given application.

$$R_{trim-down} = \frac{1.076}{V_o - V_{adj}} - 5.631$$

$$R_{trim-up} = \frac{3.759}{V_{adj} - V_o} - 0.261$$



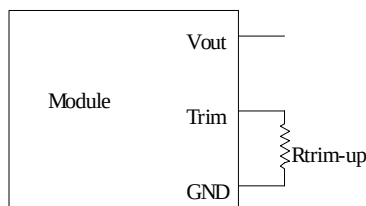
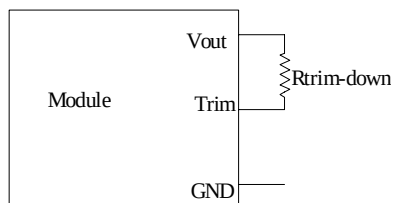
Note: Output voltage $V_o=0.9V$ when R_{trim_up} is not connected.

2) x7AH-08E500

Equations for calculating the trim resistor (in kΩ) given the desired adjusted voltage (V_{adj}) and the nominal output voltage of the converter (V_{nom}) are shown below. The Trim Down resistor should be connected between the Trim pin and Vout. The Trim Up resistor should be connected between the Trim pin and Ground. Only one of the resistors should be used for any given application.

$$R_{trim-down} = \frac{23.099}{V_o - V_{adj}} - 5.631$$

$$R_{trim-up} = \frac{3.759}{V_{adj} - V_o} - 0.261$$



Note: Output voltage $V_o=5V$ when R_{trim_up} is not connected.

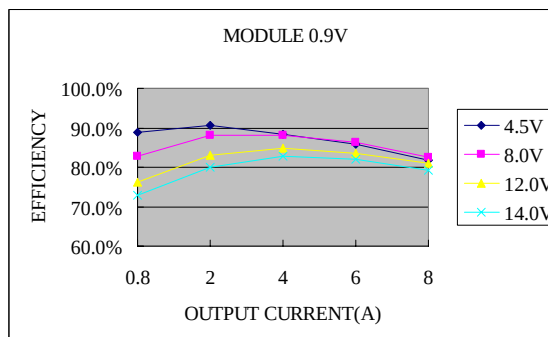
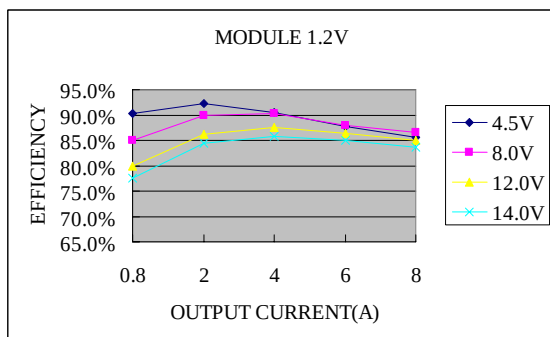
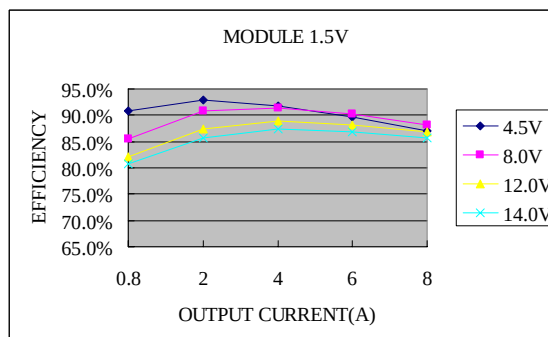
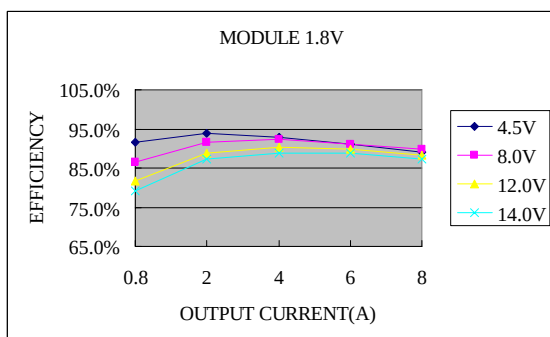
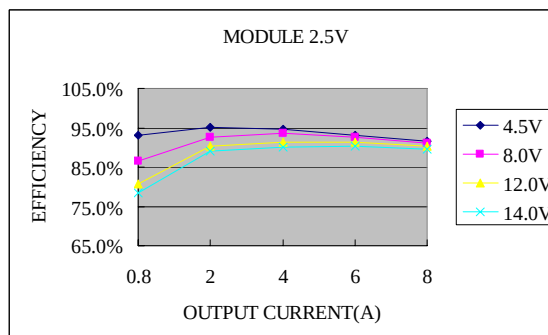
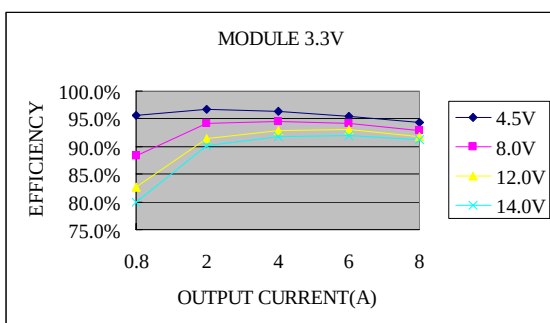
NON-ISOLATED DC/DC CONVERTERS

4.5V-14V Input

0.8V-5.5V/8A Output



Efficiency Data



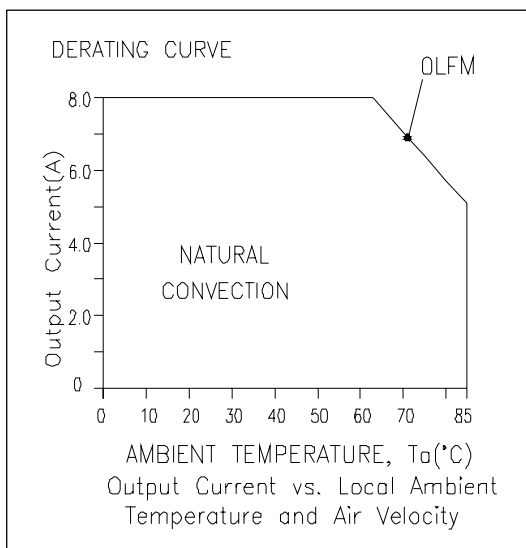
NON-ISOLATED DC/DC CONVERTERS

4.5V-14V Input

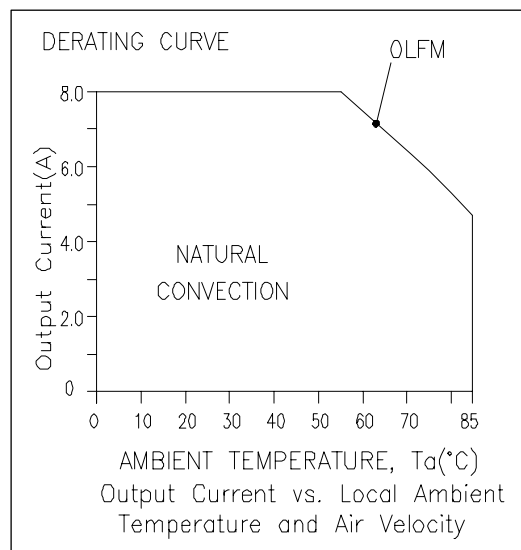
0.8V-5.5V/8A Output



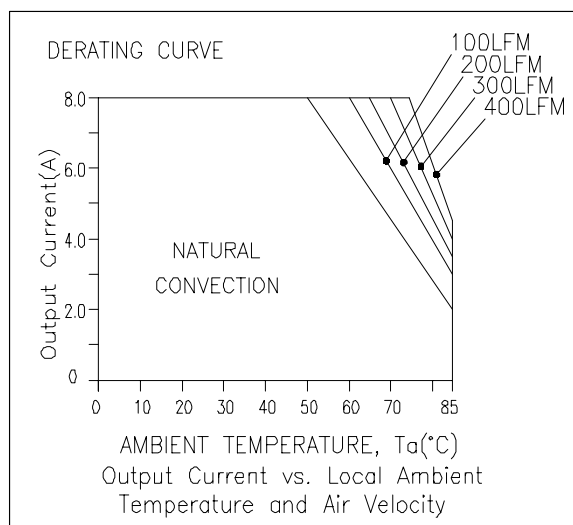
Thermal Derating Curves



$V_o=0.9\text{V}$



$V_o=1.8\text{V}$



$V_o=3.3\text{V}$

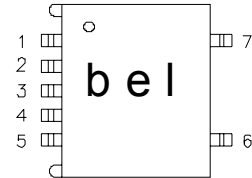
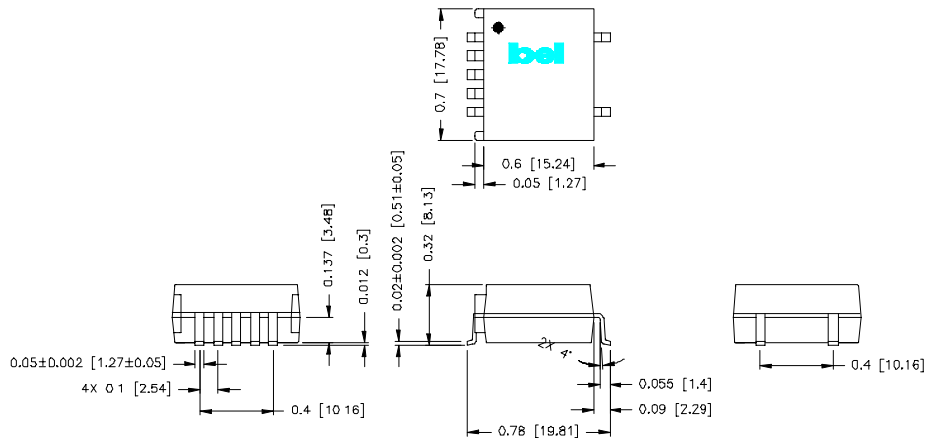
NON-ISOLATED DC/DC CONVERTERS

4.5V-14V Input

0.8V-5.5V/8A Output



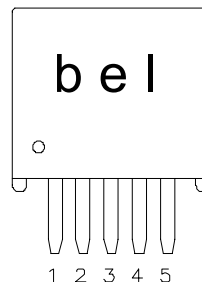
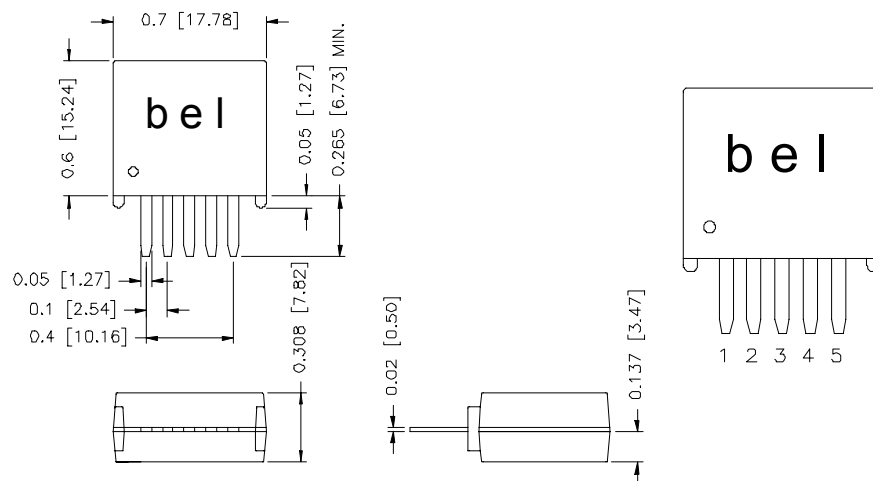
S7AH-08E



Pin Connections

Pin	Function
1	Remote On/Off (option)
2	Vin
3	Ground
4	Vout
5	Trim (option)
6	Remote Sense (option)
7	N/A

V7AH-08E



Pin Connections

Pin	Function
1	Remote On/Off (option)
2	Vin
3	Ground
4	Vout
5	Trim (option)

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